AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus for controlling an operation of a reciprocating compressor comprising:

a mechanical resonant frequency calculating unit for calculating a mechanical resonant frequency using a current and a stroke applied to a compressor;

an operation frequency reference value determining unit for determining an operation frequency reference value within a predetermined range of the calculated mechanical resonant frequency; and

a controller for comparing the determined operation frequency and a current operation frequency, and then variably controlling an operation frequency of the compressor according to the comparison result,

wherein the mechanical resonant frequency calculating unit ~~multiplies~~ obtains the mechanical resonant frequency by multiplying the stroke and the current corresponding to a load state of the compressor~~, and calculates a frequency of which an average value of one period of the value obtained by said multiplying is zero~~ and then averaging the obtained value for one period; wherein, when the mechanical resonant frequency is close to zero, the compressor obtains maximum operating efficiency.

2. (Original) The apparatus of claim 1, further comprising:

a current detecting unit for detecting a current applied to the compressor;

a stroke detecting unit for detecting a stroke generated from the compressor; and

a first comparator for comparing the operation frequency reference value and a current operation frequency, and outputting a difference value according to the comparison result.

3. (Original) The apparatus of claim 2, further comprising a second comparator for comparing a stroke outputted from the stroke detecting unit and a stroke reference value.

4. (Original) The apparatus of claim 2, wherein the controller compares a stroke outputted from the stroke detecting unit and a stroke reference value, varies a voltage applied to the compressor according to the comparison result, and thus controls a stroke.

5. (Original) The apparatus of claim 1, wherein the compressor is a linear type reciprocating compressor.

6. (Original) The apparatus of claim 1, further comprising a TDC detecting unit for detecting an upper limit point of a piston movement in a cylinder of the compressor, or a position at which a volume of the cylinder is minimized.

7. (Original) The apparatus of claim 6, wherein the controller compares a current TDC outputted from the TDC detecting unit and a TDC reference value, and, by applying a voltage to the compressor according to the comparison result, controls TDC feedback of a piston.

8. (Canceled).

9. (Original) The apparatus of claim 1, wherein the operation frequency reference value determining unit determines a current operation frequency as an operation frequency reference value without varying a frequency if a size of the operation frequency is within a predetermined range of the mechanical resonant frequency.

10. (Original) The apparatus of claim 1, wherein the operation frequency reference determining unit increases a current operation frequency as much as a predetermined level if a size of the operation frequency is greater than the predetermined range of the mechanical resonant frequency, and determines the increased operation frequency as an operation frequency reference value.

11. (Original) The apparatus of claim 1, wherein the operation frequency reference value determining unit decreases a current operation frequency as much as a predetermined level if a size of the operation frequency is smaller than the predetermined range of the mechanical resonant frequency.

12. (Original) The apparatus of claim 1, wherein the predetermined range of the mechanical resonant frequency is set to be proportional to a size of a stroke, a size of a current, a size of a value obtained by multiplying a stroke peak value and a current peak value, a size of a value obtained by multiplying a stroke effective value (Xrms) and a current effective value (Irms), or a size of a value obtained by dividing an average value (P_{avg}) of one period of a value obtained by multiplying a stroke and a current, by a value obtained by multiplying a stroke effective value (X_{rms}) and a current effective value (I_{rms}).

13. (Currently Amended) A method for controlling an operation of a reciprocating compressor comprising:

detecting a current applied to a compressor and a stroke at certain period;

calculating a mechanical resonant frequency~~, using the detected current and the stroke, wherein the mechanical resonant frequency is a frequency of which an average value of one period of a value obtained~~ by multiplying the stroke and the current corresponding to a load state of the compressor ~~is zero~~and then averaging the obtained value for one period; wherein, when the mechanical resonant frequency is close to zero, the compressor obtains maximum operating efficiency;

determining an operation frequency reference value by decreasing/increasing a current operation frequency so as to be within a predetermined range of the calculated mechanical resonant frequency, and then driving a compressor with the operation frequency reference value.

14. (Original) The method of claim 13, further comprising: comparing the detected stroke and a stroke reference value, and varying a voltage applied to a compressor according to

the comparison result thereby controlling a stroke feedback, or comparing a current TDC detected from the compressor and a TDC reference value, and varying a voltage applied to the compressor according to the comparison result thereby controlling a TDC feedback of a piston.

15. (Canceled).

16. (Currently Amended) The method of claim 13, wherein the mechanical resonant frequency is implemented by an equation below.

$$P_{avg} = \frac{X_p I_p}{2}\cos\theta_1$$

Herein, P_{avg} is a mechanical resonant frequency, X_p a stroke peak value, I_p a current peak value, and θ_1 a phase difference of a stroke and a current.

17. (Original) The method of claim 13, wherein said driving the compressor with the operation frequency reference value comprises:

determining a current operation frequency as an operation frequency reference value without varying a frequency if a current operation frequency is within a predetermined range of the mechanical resonant frequency;

increasing a current operation frequency as much as a predetermined level if a current operation frequency is greater than a predetermined range of the mechanical resonant frequency, and then determining the increased operation frequency as an operation frequency reference value; and

decreasing a current operation frequency as much as a predetermined level if a current operation frequency is smaller than a predetermined range of the mechanical resonant frequency, and then determining the decreased operation frequency as an operation frequency reference value.

18. (Original) The method of claim 13, wherein the predetermined range of the mechanical resonant frequency is set to be proportional to a size of a stroke or a size of a current.

19. (Original) The method of claim 13, wherein the predetermined range of the mechanical resonant frequency is set to be proportional to a size of a value obtained by multiplying a stroke peak value and a current peak value or a size of a value obtained by multiplying a stroke effective value (Stroke rms) and a current effective value (Current rms).

20. (Original) The method of claim 13, wherein the predetermined range of the mechanical resonant frequency is set to be proportional to a size of a value obtained by dividing an average value (P_{avg}) of one period of a value obtained by multiplying a stroke and a current by a value obtained by multiplying a stroke effective value (X_{rms}) and a current effective value (I_{rms}).

21. (Canceled)